Day 20

(1) Find the eigenvalues of $A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 1 & 4 & 9 & 4 \end{bmatrix}$.

For each eigenvalue, find an eigenvector.

(2) Find the eigenvalues of $\begin{bmatrix} 5 & 1 \\ 1 & -5 \end{bmatrix}$.

For each eigenvalue, find an eigenvector.

(3) Repeat (2) for $\begin{bmatrix} 5 & -1 \\ 1 & 5 \end{bmatrix}$.

(4) Find a basis for the eigenspace $\begin{bmatrix} 4 & 1 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

has for its unique eigenvalue.

(5) Repeat (2) for $\begin{bmatrix} 5 & 0 \\ 1 & 5 \end{bmatrix}$.

(6) Give an example of a matrix with an eigenvalue that has algebraic multiplicity 4 & geometric multiplicity 2.